

THE HUDSON AND MANHATTAN TUNNELS

(WILLIAM M. ADOO PRESIDENT)

UNITING NEW YORK AND NEW JERSEY

IN PICTURE AND STORY



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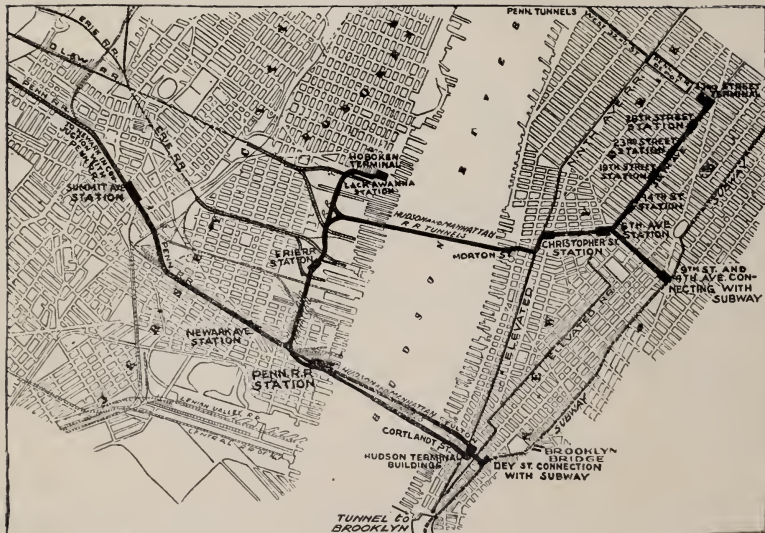
THE
HUDSON & MANHATTAN
TUNNELS

(WM. G. McADOO, Pres.)

Uniting New York and New Jersey

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This is the Hudson Terminal Buildings, wherein are located the stations of the south twin tubes

THE HUDSON AND MANHATTAN TUNNELS



THE STORY OF TUNNELS such as the McAdoo 'Tunnels, passing under the Hudson river between New York and New Jersey, is not without interest, even to the lay mind, which cares nothing for the whys or wherefores of things engineering so long as they cost them not a moment of worry, nor a penny in treasure, but afford the relief they have so often entertained in their rosiest of dreams.

A Universal Need. Novel experiences are constantly sought, new emotions ever desired. The hindrances of surface transportation and traffic hold no fascination or magnetism for the romantic soul; the delays and uncertainties of surface congestion present no allurements to the busy traveler. And so it came to pass that tunnels became a necessity; almost a rage with busy workers in the hives of industry in the great American metropolis, and now have become necessary channels of communication beneath rivers, the surface of which is always congested with an ever-



Bent upon a voyage of exploration, inspection and adventure, we descend to the station, exchange a nickel for a ticket

increasing shipping, and often bound hard and fast in ice or the dangerous and annoying embrace of heavy fogs.

But to revert to our story: This tunnel—or strictly speaking, these tunnels (for there are four of them, two extending under the river from Cortlandt street, New York to Jersey City, thence connecting with the terminals of the Pennsylvania, Erie and Delaware, Lackawanna and Western railroads, from whence there extend under the Hudson two other tunnels to Christopher street, New York, thence to and up Sixth avenue as far as Thirty-third street)—will for years, if not for ages, stand as the greatest engineering feat undertaken by man.

Haskins' 1874 Tunnel. The idea of tunneling under the Hudson river had its conception in the fertile brain of Colonel D. C. Haskins, an English civil engineer of considerable note and ability, in 1874, and he set about organizing a company to finance and bore the tunnel, and after arduous labor, and much persuasion succeeded in interesting about two millions of dollars of New York capital in his undertaking. He began work in 1878, and had constructed one thousand, two hundred fifty feet of tunnel, when a cave-in of the roof sheathing, in 1880, drowned twenty-one men in the air-locks. The



And await the arrival of our train which is to whirl us through the tunnel.

money having been all expended, and further financial aid being lacking, the company was forced to abandon the enterprise in that year.

A New Company. Colonel Haskins, having failed in his attempt to interest additional American capital in his enterprise went to England, where he succeeded in obtaining about two millions of dollars of English money, and a new company was organized to take over the franchise, and other assets of the old company. Colonel Haskins in resuming his self-imposed task of uniting New Jersey and Manhattan Island by an sub-aqueous route had in mind the establishment of a mammoth terminal station on a site in close proximity to Washington Square, where railroad trains from every section of the country could discharge passengers and freight.

In 1890 the new company, after pushing the tube one thousand, eight hundred feet further along toward New York, fell into bankruptcy, and work was again stopped. Colonel Haskins, unable to secure more capital for his enterprise, abandoned the project, and the unfinished work lay all but forgotten under the waters of the majestic Hudson.

A New Man. In 1901 there came from Chattanooga, Tenn., to New York, a young man who had been born in Marietta, Ga., thirty-eight years before. He was unknown



Here we see the train at its terminal; on the right we enter, on the left we leave.

to fame, to finance, to engineering, and he, at that time, had no intention of abandoning his career in the practise of the law. But one day Willliam Gibbs McAdoo being called to Hoboken on business, was much vexed by the delays occasioned by a river full of craft of every conceivable description trying to feel their way through an almost impenetrable sea of fog. Thus delayed his thoughts were turned to the necessity for some more safe and rapid method for transacting business across the Hudson. So in his moments of leisure—perhaps at first from a mere sense of curiosity—he began to investigate the now abandoned tunnel. He found that its franchise had yet about twenty-five years to run, and that both franchise and uncompleted tunnel could be bought for a song. The more he considered the project, the more convinced he became that the tunnel was an absolute necessity; that it should be completed; that the public demanded just such relief as it and it alone could afford. He also realized that it was a stupendous engineering feat the difficulties of which could only be surmounted by modern methods. In a casual way from time to time, he consulted with the master minds of the engineering world, and found that, if the necessary capital was supplied, the tunnel could be completed. Then this master mind set about to interest capital to complete the tube,



Our train having arrived at the platform, let us now go aboard

but the capital he sought was not to be of the "high-finance" kind. He believed his enterprise to be a legitimate, conservative business proposition, and therefore endeavored to interest only conservative capitalists and investors in the undertaking. He unfolded his plans and needs to Pliny Fisk and William M. Barnum, of the financial firm of Harvey Fisk & Sons in such a straightforward and business-like way as to win the confidence and hearty coöperation of these masters of conservative banking, among whose clients are numbered many of the country's richest conservative investors. The young lawyer convinced the bankers of the possibility, the urgent necessity, and the profitable income to be derived from an investment in these tunnels and they undertook the financing of the enterprise.

The New York and Jersey Tunnel Company was organized in February, 1902, to take over the title, franchise and other interests in and to the long-defunct preceding companies. The new company purchased new and modern machinery and equipment, secured the services of the best engineering talent the country could afford, and quietly but honestly set to work to finish the tunnel under the Hudson from Hoboken to Morton street, New York.



And settle ourselves comfortably into a spacious seat in one of the several sections

The tunnel, now known as the south tube, was completed in 1905, and the north tube, which parallels it, at a distance of about thirty feet, was put through. And these tunnels, that we are about to inspect, were opened to the public on Tuesday, February 25, 1908, by President Theodore Roosevelt, Governor Charles E. Hughes of New York, and Governor John Franklin Fort of New Jersey.

Hudson and Manhattan Railroad Company. The New York and Jersey Tunnel Company was organized and financed merely to complete the old tunnel, so for the construction of additional tunnels and terminals, a new company had to be formed, and that company was the Hudson and Manhattan Railroad Company, which was organized in May, 1904, with William G. McAdoo, as president.

Where the Tunnels Lead. These "McAdoo" tunnels enter Manhattan Island at the foot of Christopher street, where they connect with a subway constructed and operated by the Hudson and Manhattan company, extending up Christopher street to Sixth avenue, thence north to Thirty-third street, where connection will be effected with the mammoth terminal station now in course of construction for the Pennsylvania and Long Island system. There are way stations on Christopher street at Ninth and Sixth



And from the windows we may view the crossover, or mouth of the two tunnels.

avenues, allowing close connection with the west-side elevated systems of the metropolis. The way stations on Sixth avenue are located at Eighth, Fourteenth, Nineteenth, Twenty-third, Twenty-eighth and Thirty-third streets.

But these tunnels alone are not all that this remarkable man has accomplished for the people of the American metropolis, during his seven years residence in the City of New York.

Hudson Terminal Buildings. There has been reared, also, two twenty-two story buildings, known as the Hudson Terminal Buildings which are of fire-proof twin construction, and cover nearly two city blocks at Cortlandt, Dey, Fulton and Church streets. Here are located the terminals of the two great southern twin tubes to Jersey City, and it will be but a short time when these tubes will be opened to the public.

This building goes on record as the largest office structure in existence, containing as it does, in its twenty-two stories, eighteen and a half millions of square feet (or more than twenty-nine acres) of floor space, affording comfortable accommodations for over ten thousand office tenants. These twin buildings are respectively officially designated as the Fulton, and the Cortlandt, and are joined by an iron bridge across Dey street, affording easy communication between the two mammoth structures.



As we onward speed, we can view the construction of the tube, and observe on the left a splicing chamber.

About thirty feet below the street level are located the loop and station platforms where one thousand persons a minute, or five hundred thousand people a day can easily be handled. Just above this floor is located what is known as the "concourse," where a restaurant, lunch counter, flower booth, telephone booth, telegraph stand, newspaper kiosk, bootblack stand, and other modern railroad conveniences will be established.

Fifty-two elevators afford prompt, comfortable, safe, and easy access to the various floors, already rented as offices to some of the largest of our American corporations, among which may be mentioned the American Steel Company, while the Federal Government has engaged about an acre of space on the first and second floors for the New York Post Office as a receiving and forwarding station.

Each building will also have a dining club, on the roof, that in the Cortlandt building being known as the Railroad Club, while that in the Fulton building will be designated as the Machinery club.

The Construction. The story of the construction of the tunnels is a long one; too long, indeed, to be more than touched upon in the present booklet. Here the story is, however, graphically told in pictures which carry you along through the various stages

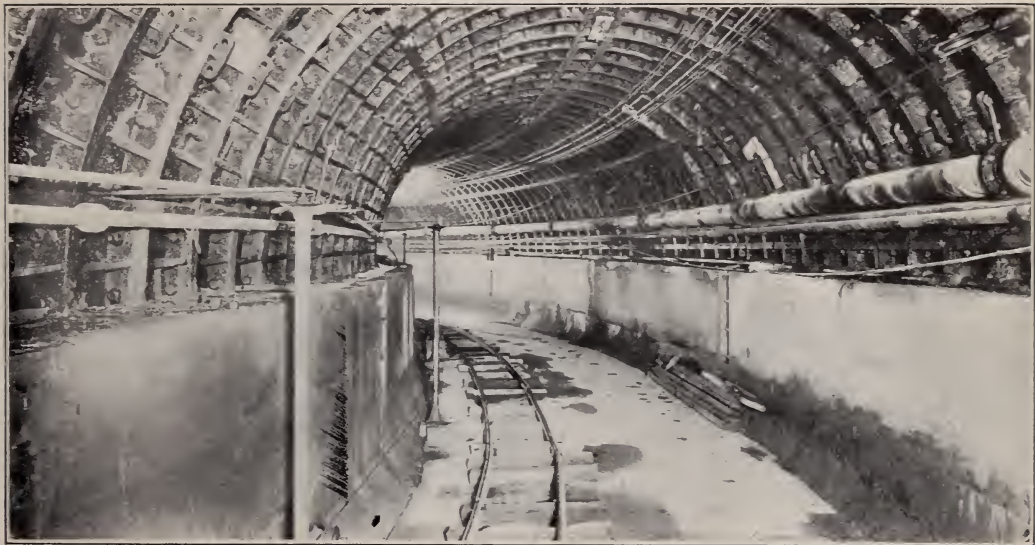


Here we pass the first signal station, and speed merrily onward

of construction; you are to make a picture trip through the tube; and now, as briefly as possible, the details of the construction are to be unfolded to you, without any of the professional verbiage so often used in works such as this one.

In the original work upon this tunnel, under Colonel Haskins, compressed air was first used in construction, when its aid and usefulness in subterranean construction was clearly proven. Haskins even used compressed air as a means of removing from the tunnel the sand and silt, first having mixed them with water. Since those days, however, the use of compressed air in sub-aquatic engineering has made great, important and rapid strides toward the perfect system used by the Hudson and Manhattan company in the construction of these tubes.

Pilot Tunneling. From the time when Haskins drove a pilot tunnel (six feet six inches in diameter, thirty or forty feet in advance of the main works, enabling him to lay stronger foundations for the roofing irons and brick and masonry of which he was constructing his tunnel), to the introduction of the high-pressure air chambered shield used by the Hudson company, there has been a wonderful advance in engineering science. Behind this shield men can labor without fear of cave-in as the high air-pressure in the



Toward the curve under the mighty Hudson, and we are at our journey's end.

chamber holds the mud, sand, and silt in place until loosened and removed with pick, shovel or dynamite. The shield is several inches larger than the diameter of the completed bore, thus allowing room for the placing of the construction materials. In the present tunnels, these are huge rings of steel securely cemented and bolted together, and sheathed with concrete either all or a part of the way around the circle. The shield is forced forward into the soil by huge jack-screws, and its correct path is maintained to the fraction of an inch by careful mathematical calculation. Electricity was also used as a means of both light and power in the construction work, greatly facilitating the speed and accurate completion of the undertaking.

The Tubes. Each tube is fifteen feet three inches in diameter, and lies from sixty to ninety feet below the surface of the water, or from fifteen to thirty feet below the bed of the river. The total length of the sub-aqueous portion of the tube is approximately five thousand seven hundred feet, or about two and a half miles.

Under the River. So brilliantly lighted are the tunnels that one in entrancement may look far into the tube under the mighty river on whose bosom float the commerce of a nation; from whose piers departures may be made to almost every habitable portion



Here we look upon the giant minds who have made possible the tunnel: McAdoo, Jacobs, Davies and associates.

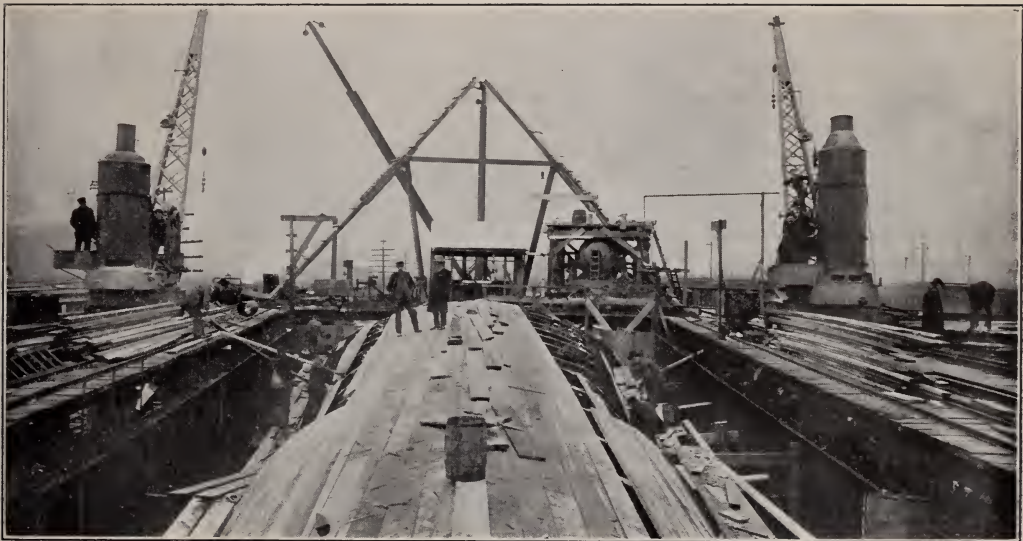
of the globe; on whose troubled breast ride the largest, the grandest, the most expensive and luxurious floating palaces built.

The Stations. The stations are built on what is known to the engineering fraternity as the tangent form, which means simply that the tracks in the stations are perfectly parallel with the platforms, that there are no curves where the passengers are allowed to enter the cars, thus avoiding the dangers of the "wide step" so often found in other transit systems of the great metropolis.

There are two platforms in each terminal, the arriving and departing. Passengers being given egress and ingress on opposite sides of the cars, thereby avoiding the station delays heretofore so perplexing.

The stations are designed with a view to permanency, comfort and beauty. They afford ample facilities, not only for the business of the present, but for the increasing traffic of the future.

Steel and Concrete Throughout. Steel and concrete alone enter into the construction of these subterranean stations. Vaulted arches rise on all sides, from whose artistic and substantial sides gently glow the iridescence of the electric bulb, which casts over

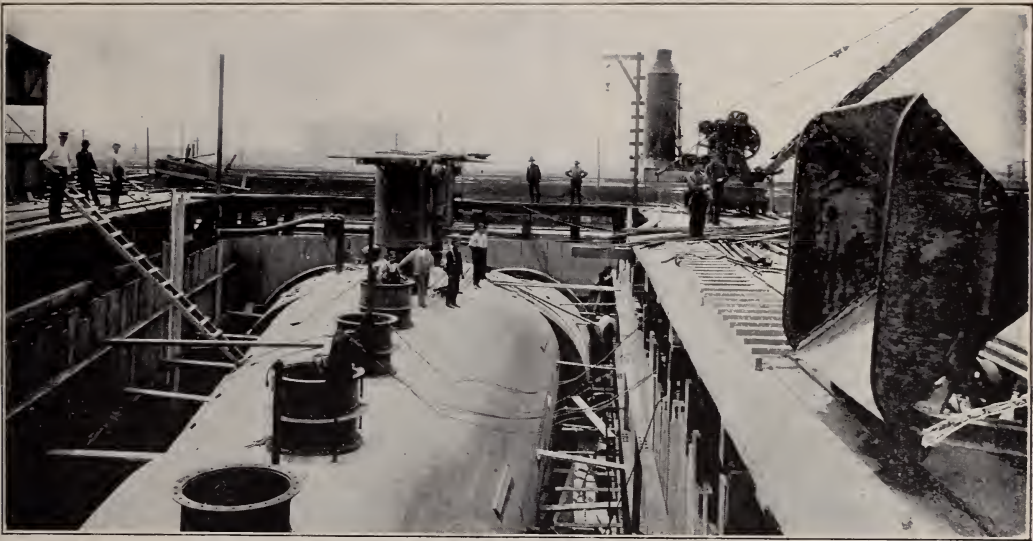


Making ready to concrete the cloistered roof of a station.

the scene a gentle halo as of early twilight, reminding one most forcibly of a treasured visit to some sombre cloister, or to the vaulted cellars of some old mediæval castle on the picturesque Rhine, wherein are ageing and ripening the luscious juices of the grape. The wand of the magician seems to have left its mystic spell, the touch of the artist its harmonizing beauty, the brain of the architect the air of security and stability, and the moulding and stroke of the artisan its ever-present and masterly monument to American engineering enterprise.

Ventilation. There is always a gentle breeze here. The trains in their passing too and fro act as giant pistons whose every movement changes the atmosphere in the tunnel, forcing out the foul air, and creating a vacuum in the rear which draws in a supply of fresh air from the surface, thereby giving an absolutely perfect ventilation. It is for this sanitation system that the web-wall was built between the tracks in the subway portions of the system, in contradistinction to the system in vogue in the construction of other metropolitan subways.

A Giant System. The McAdoo system of tunnels and subways consists of about twenty miles of underground and under-river construction in the metropolitan district,



Ready for the webbing of tangled iron rods which are to form the archings.

and when the system is completed, the cost will reach nearly, if not quite, seventy millions of dollars.

The work has afforded employment to an army of professional and laboring men, as many as eight thousand five hundred persons having been engaged at one time.

The Cars. The cars are constructed exclusively of steel and carborundum, and are absolutely fireproof. The trains are vestibuled and the cars divided into sections; entrance to and exit therefrom is obtained through sliding doors at both ends and in the center of each car. These are controlled and operated by compressed air.

Signaling. A train is made up of eight cars, forming a complete compressed air system, automatically signaling the motorman to "go ahead," when every car door in the train has been securely closed. No bell or other form of signaling is used, and while any one door in the train is even slightly ajar, no signal to "go ahead" can possibly reach the motor car.

The cars are electrically propelled, lighted and heated, and run under a headway of ten minutes, completing the trip between the Hoboken terminal and Nineteenth street, New York, in about ten minutes.



The tangle of iron webbing—first preparation for the concrete.

And here ends our story of the greatest engineering work ever attempted, the most sublime and far-reaching travelling beneficence for mankind.

A Closing Chapter. In a chapter apart by itself, let us pause to emblazon upon the roll of honor, the names of the master minds who have, by their accomplishments, proved themselves the leading geniuses of engineering endeavor of any age:

WILLIAM GIBBS McADOO

President, The Hudson and Manhattan Railroad Company

WALTER G. OAKMAN

President, The Hudson Construction Company

CHARLES N. JACOBS

Engineer-in-Chief

J. VIPOND DAVIES

Deputy Engineer-in-Chief

PLINY FISK

Member, Harvey Fisk & Sons

WILLIAM M. BARNUM

Member, Harvey Fisk & Sons



Concreting and waterproofing what is to be the ceiling of the station.



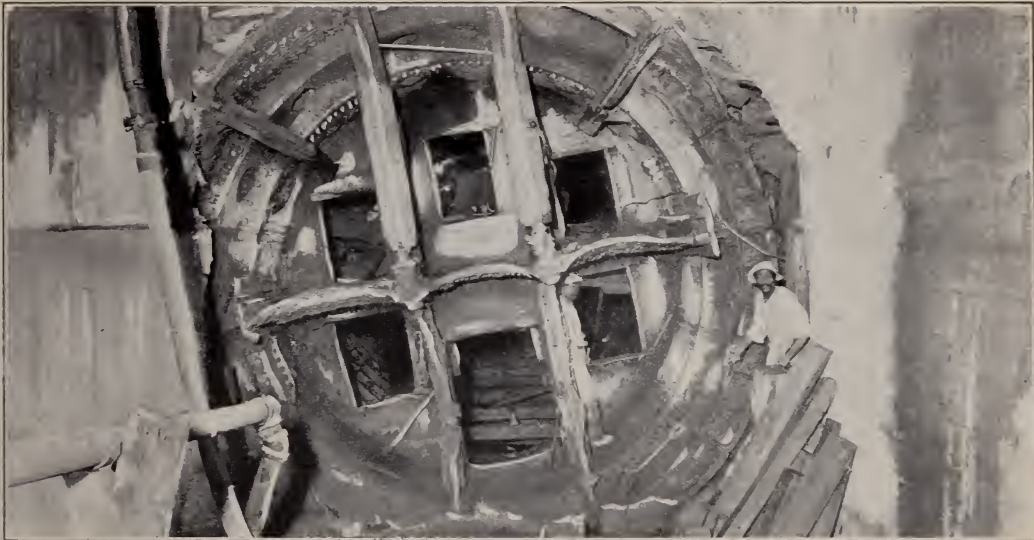
Just a view of the construction work at the Hoboken terminal.



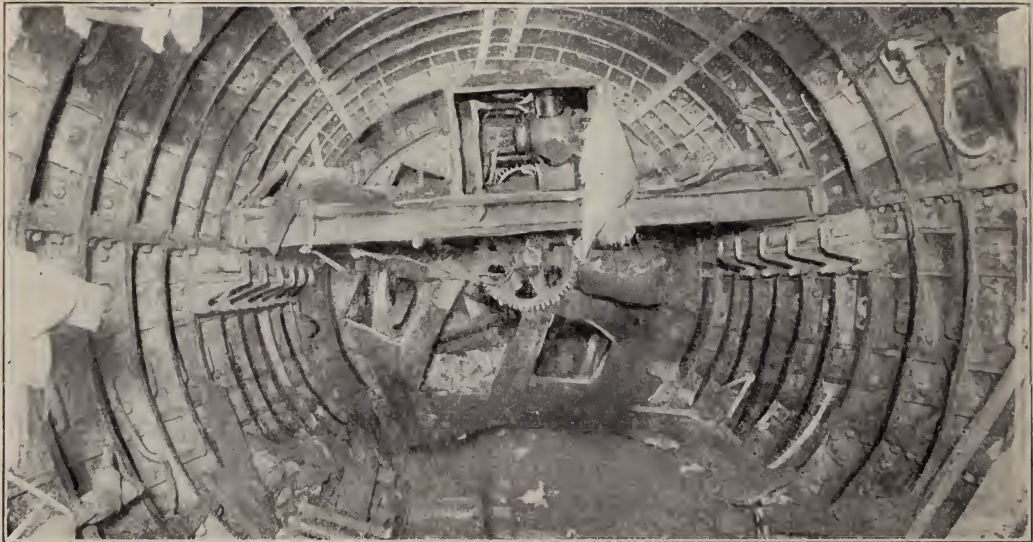
One of the mammoth caissons about to depart for fields of useful engineering endeavor.



Here we have a fine view of the shield used in tunnel construction,



And here a view of the cutting or business end of the shield, as it breaks through into a completed section.



Again we return to the chambers wherein are located the machinery,



And wherein labor under high air pressure, an army of sand hogs



Who send in ore cars, the sand, gravel, stone and other



Terra firma through the air chambers, and thence back



By means of electrically propelled trains, to the entrance of the



Caisson, where it is raised to the surface to be finally disposed of.



This is how the shield looks as it breaks through into an approach.



It was here that conjunction was made with the old, long-abandoned attempt at tunneling.



And, having arrived at the terminal, we see another shield about to begin its mission for the betterment of transit facilities between two states.



This is how the steel cars look in daylight, and how



A train looks on the storage tracks, making ready to carry the traveler under the majestic Hudson to his business or pleasure on the further side.



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